

Kentucky State Legislature

Regarding an ACT relating to Cremation

June 17, 2021

Comprehensive Information on Alkaline Hydrolysis as a Form of Cremation

Scope: This document has been prepared by Samantha J. Sieber for Kentucky lawmakers as a resource for general and technical information on alkaline hydrolysis. I have been a biologist in the field for over 16 years, and I have helped over 40 states (along with many other jurisdictions worldwide) draft legislation to make this option available to families. I have reviewed in detail the proposed language revision for Kentucky's statute to accommodate alkaline hydrolysis, and it is well-written. I am testifying in support of this bill.

Overview

Alkaline hydrolysis (AH) is an alternative to flame-based cremation and burial. This process achieves the same end result as flame cremation, which is reduction of the body to final ash remains. It does so without burning any fossil fuels, without emitting any harmful greenhouse gases, and using 90% less energy than flame cremation. Additionally, mercury is not emitted to the air with alkaline hydrolysis as it is with flame cremation.

The lower temperature of the process (300°F, compared to 1600-1800°F of flame cremation) does not vaporize this metal. Mercury is contained in dental amalgam, and it remains bound in the filling. These fillings are recycled through the same EPA recyclers that dental offices use, and are never released to the environment through air or water.

Options for services and memorialization are unchanged. Most families still hold a viewing and service to honor their loved one. The body may still be embalmed for transport home from another state or country, or to facilitate family wishes for traditional viewings and services. In fact, embalming chemicals are broken down completely by the alkaline hydrolysis process.

The family still receives ash remains, in fact approximately 20-30% more. Anything that can be done with ashes from flame-based cremation, can also be done with ashes from this water-based cremation. The ashes are completely sterile and safe to handle.

By scientific definition, ashes are the inorganic minerals that remain after all organic material has been broken down. The minerals that remain from alkaline hydrolysis, flame cremation, and burial after many years – are the mineral remains of the bones, or calcium phosphate.

Because the temperature of the process is approximately 1500 degrees less than flame cremation, and it uses a very gentle flow of water versus strong combustion, there are more of the mineral remains retained (which are normally lost up the stack).

Options for ashes are endless, and people's choices depend on their religious beliefs and personal preferences.

1. Many families choose to have the ashes placed in a special urn to inter the ashes at a cemetery, family plot or mausoleum, or in a columbarium.
2. Families may also bury or scatter the ashes on land or sea (as local regulations allow).
3. Many options for keeping their loved one close also exist, such as cremation jewelry or memory glass, where some of the ashes are incorporated into a piece by local artists.

How AH Works

This process takes place in a state-of-the-art stainless steel system that is powered only by electricity. Just like with flame cremation where families have options for their choice of suitable cremation casket (or "cremation container"), families have options with alkaline hydrolysis as well – specifically made to biodegrade in the process.

Once the deceased is placed in the system, the process works by gently circulating a heated solution of 95% water and 5% alkali around the body for an extended period of time. The flow of the water is similar to that which you would see in a small creek.

Similar to flame cremation, all that remains for the operator at the end of the process are the final bone remains (calcium phosphate) and any medical implants. Just as with flame-cremation, the final bone remains are processed into a fine ash powder for return to the family in an urn.

The medical implants from alkaline hydrolysis are in remarkable condition, clean and ready for recycling. This is one of the greatest environmental benefits of this option, as those precious metals stay "in the loop" for future use instead of being buried in the ground forever.

Alkaline hydrolysis is a proven sterilization technology in which all pathogens are destroyed, as well as all chemotherapy and embalming agents (if present in the body).

Alkali is the chemical opposite of an acid. It is made from sodium and potassium salts. The alkali added to the process is based on the weight of the body, and it is completely consumed by the end of the process.

The amount of time the process takes depends on the temperature of the process. The process typically takes 6 hours at 302°F, or 16 hours at 204°F. For comparison, flame cremation typically takes place at 1600-1800°F for 2-3 hours.

The amount of water used in the process is less than a household of 4 uses in a single day – or, the equivalent to 2-3 days use of water for a single individual. The ending process water consists of 96% water, and 4% amino acids, small peptides, sugars, and salts – these are the organics of the body broken down into their most basic building blocks. There is no DNA or RNA remaining. With alkaline hydrolysis, these materials go to the local sanitation system where the

water is filtered, cleaned, and recycled to the environment. With flame cremation, these same materials go into the air and subsequently the water. With burial, these materials go into the ground and subsequently the water table.

Unlike flame cremation, the ash content is composed only of the mineral calcium phosphate remains of the deceased. There is no ash content from caskets, clothing, cardboard, etc.

The Family's Perspective

The numerous end-of-life choices that families must make are very personal. We have learned over time that some common sentiments expressed by families about this option include:

- They are grateful to have a choice.
- They prefer a process that does not use fire/flame.
- They prefer receiving up to 20% more of their loved ones' ashes returned to the family.
- They personally perceive this to be a more gentle option than flame-based cremation.
- They value the decreased environmental impact of the process.
- If the equipment is on-site (as is possible with this emission-free technology), they are comforted by the fact that their loved one is not leaving the care of their selected funeral home.

Data analysis of cremation records (for funeral homes in the United States and Canada offering this option) has shown that 80% of families desiring cremation select this option over flame cremation. Preplanning rates are significantly higher than 80%.

Legislation and Regulation

Right now, Kentucky families are having to arrange transport to neighboring approved states for this option which adds further hardship (emotionally and financially) to the family during an already devastating time.

There are numerous points of regulation that will touch the governance of this equipment. In order for an alkaline hydrolysis system to be used, in this order: 1) the law must allow it; 2) the business must be licensed by the Board; 3) the equipment must be compliant with state health and environmental regulations; 4) the locale must approve the location of the equipment (municipal planning and zoning); and 5) the release of the process water must be done with permission (written approval from the wastewater authority). What we are asking today is to move forward with Item #1, addressing the change in law that must happen.

A legislative change to address alkaline hydrolysis in Kentucky Revised Statutes is necessary in order to make this option available for Kentuckians. Right now, the language in the law simply does not accommodate alkaline hydrolysis.

- Not formally addressing this method in law *puts the licensing board in an unworkable position* legally-speaking, and sets poor precedent for any future options that they wish to regulate.

- Kentucky businesses *cannot afford to make the investment or gain access to funding* to bring this option to Kentucky families without it being formally addressed in law. The risk is too high, and financing from investors or banks will not be accessible without the security of legal approval.
- Families will ultimately pay the price if this is not properly addressed, as providers will not take this risk. Families deserve access to options, and they need the option to be available locally. Families also need the security of AH being around long-term if they are making pre-planned arrangements.

Research

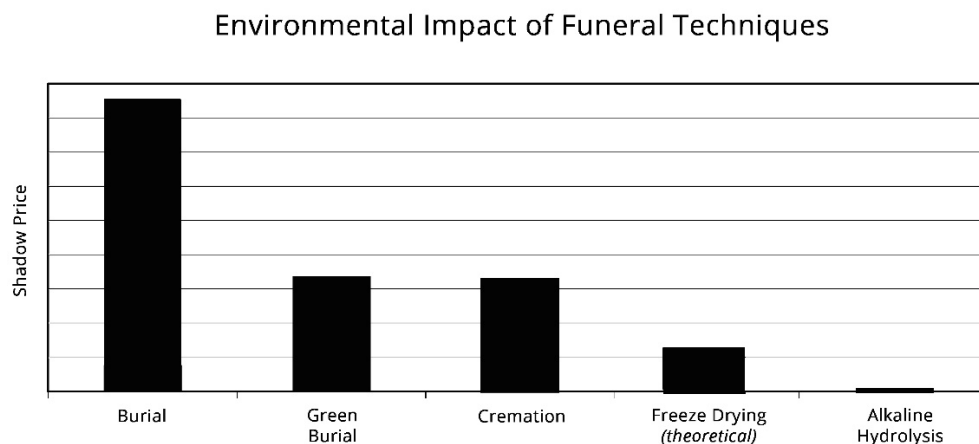
Modern alkaline hydrolysis technology as we know it today has been around for 30 years. During this time, the environmental benefits have been vetted by some of the best environmental agencies in the nation. While this option is sometimes recognized as “very new” in the funerary field, beginning in 1995 it was pioneered for respectful disposition of human bodies by prestigious will ed body programs like Shands Hospital at University of Florida, MAYO clinic, UTSW Medical School, UCLA School of Medicine, and now many more. It has been available to families as an option in parts of the world, primarily the United States, *for over a decade!*

Much of the research on alkaline hydrolysis exists due to its heavy adoption in the scientific fields. There are numerous published, peer-reviewed studies and complete environmental analyses on the technology. It is the preferred technology for sterilization and disposition of animal mortalities at universities, research facilities, and pharmaceutical and bio-containment laboratories because of its environmental benefits and its ability to destroy all pathogens.

Sometimes adversaries point to its long history of use in the scientific fields as evidence that this is a waste disposal technology trying to make its way into the funerary profession. This is simply not the case. Animal mortalities must be handled through the same methods we use for final disposition of a human body, including burial, incineration (cremation), and alkaline hydrolysis.

Alkaline hydrolysis is an option in the funerary profession because it meets the needs of many people on many levels, including issues surrounding dignity and respect, financial needs, and cultural, religious, and social customs that precede and follow the disposition.

Alkaline hydrolysis has also been analyzed as part of an intense Live Cycle Assessment (LCA) of funerary practices, which examined the environmental impact of our customs, services, disposition, and final placement. An LCA is a scientific study that examines a product or service from cradle to grave. A published and peer-reviewed LCA found alkaline hydrolysis to have the lowest impact of all options based on the analysis of all 18 environmental impact categories. This cradle to grave approach covers all beginning to end of this option, including the manufacturing, transport, and impact of the chemical used, the source of the electricity, the water used, and the release of the process waters to the local sanitation, and the recovery and recycling of the metals following the process.



Source: Keijzer, E.E., Kok H.J.G. *TNO Report: Environmental Impact of Different Funeral Technologies*. 2011.

ENVIRONMENTAL IMPACT CATEGORIES ANALYZED

Climate change
Ozone depletion
Humane toxicity
Photochemical oxidant formation
Particulate matter formation
Ionizing radiation
Terrestrial acidification
Freshwater eutrophication
Marine eutrophication
Terrestrial ecotoxicity
Freshwater ecotoxicity
Marine ecotoxicity
Agricultural land occupation
Urban land occupation
Natural land transformation
Water depletion
Metal depletion
Fossil depletion

References:

- Denys G. Validation of the Bio-Response Solutions Human-28 Low-Temperature Alkaline Hydrolysis System. *Applied Biosafety*. 2019;24(4):182-188.
- Keijzer, E. The environmental impact of activities after life: Life cycle assessment of funerals. *Int. J. Life Cycle Assess.* 2017;22: 715-730.
- Keijzer EE Kok HJG. Environmental Impact of Different Funeral Technologies. *TNO Report*. 2001.

Appendix A: Photo References

Pet Systems



Above: Photos of Aquamation (alkaline hydrolysis) systems for pets. These are often installed in vet clinics, crematories, and funeral homes to serve pet families. AH for pets is already approved in the state of Kentucky as pet cremation does not fall under Funeral Law. The use of this technology for funeral homes and crematories must be addressed in Funeral Law in order to be available to families.

Human Systems



*Above Left: An Aquamation (alkaline hydrolysis) system in a ME crematory next to two flame units.
Above Right: A system in a MN funeral home; the unused casket room was converted for this use.*



Above: A system installed in a MN embalming room.

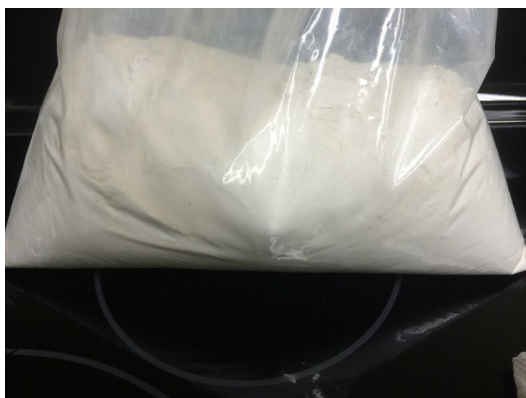


Above Left: A system installed with a family viewing area in a South African funeral home.



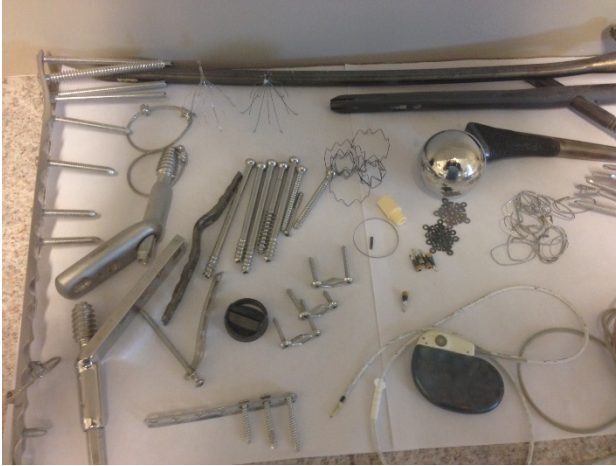
Above Right: A system installed in a Canadian funeral home.

The Final Ash Remains



Left: Powdered mineral ash that will be placed in an urn for return to the family.

Medical Implants



Above: Medical implants recovered from alkaline hydrolysis on the left, and medical implants recovered from flame cremation on the right. Notice that with alkaline hydrolysis, the implants are in excellent condition, and that pacemakers do not have to be removed.